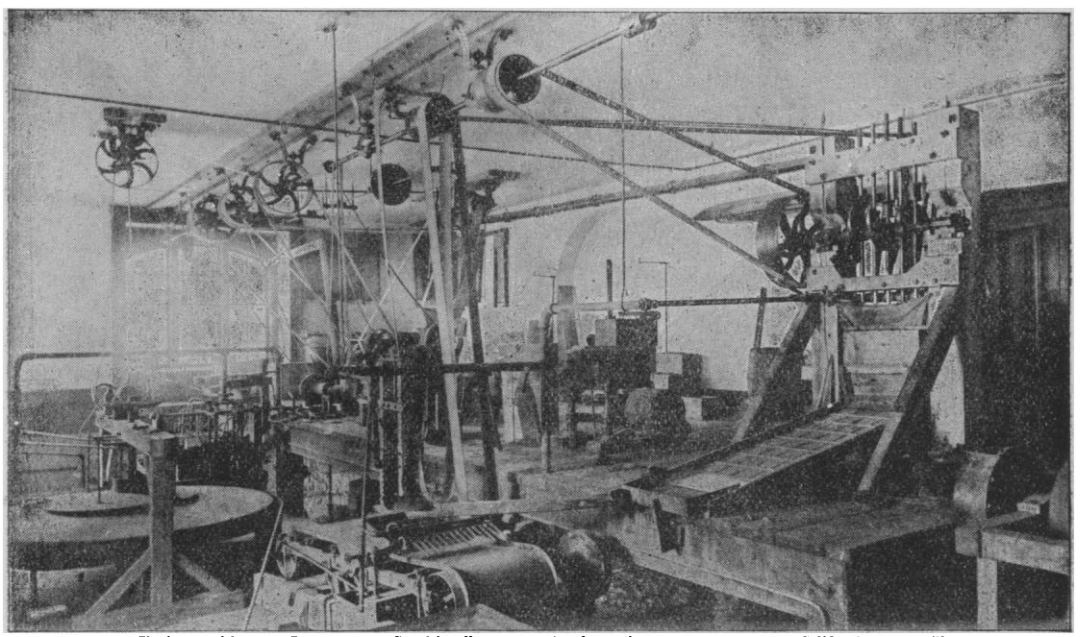
THE NEW MINING LABORATORY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

BEFORE the era of railroads there was comparatively little demand for technically educated engineers; and those who were classed as such were either self-made men, or men who, after a college course, had studied engineering from a special liking for the profession. This process of selection brought forward many of the best engineers the world has ever seen; but the time of preparation for work extended over a period of some six to eight years. The almost incredibly rapid development of the railroad and of manufacturing and mining industries has created, within the past twenty-five years, a demand for engineers which cannot be met by the comparatively slow methods of former years. In response to this demand, schools have sprung up, most of which aim to prepare young men, by a four-years' course, to become engineers. As a natural result, there has been a rush of young men to these schools, in the expectation of finding lucrative positions open to them immediately upon graduation.

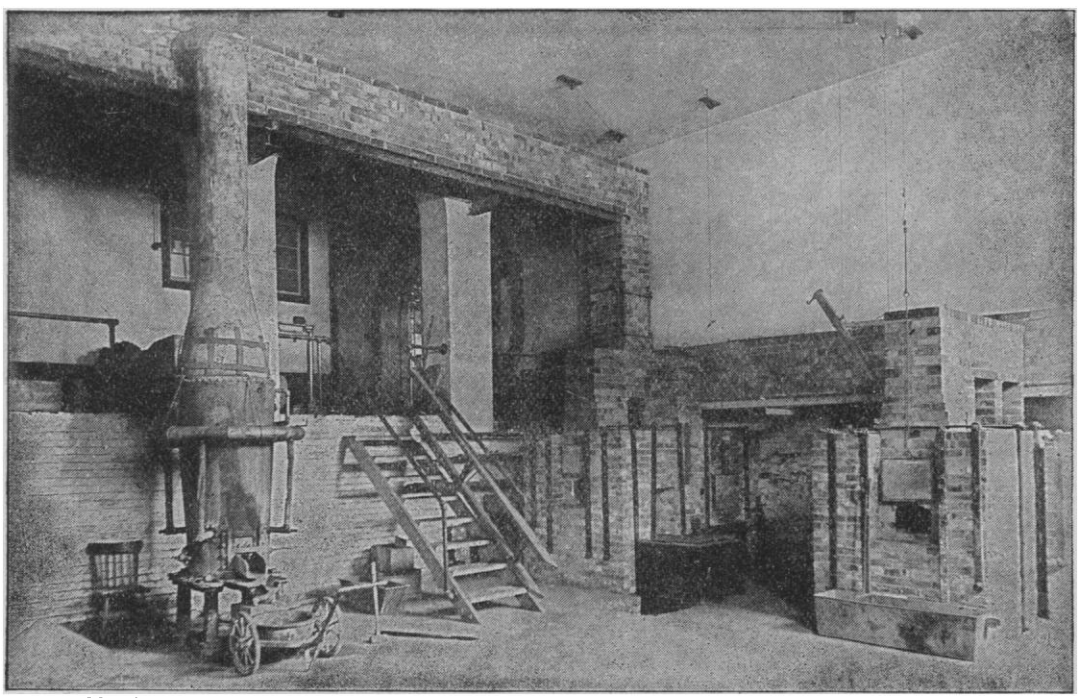
Perhaps one man in four selects a given course because he knows exactly what he wants to do. The other three have no special bent, and therefore follow their classmate's lead. The duty devolving upon the school is consequently to instruct to the best advantage the students of both classes in order that they may meet the world's demand. There is room in the field of discovery and enterprise, not only for the Siemenses, the Bessemers, and the Holleys, but for an army of intelligent managers of works and their assistants. The student who has it in him to become a Siemens or a Bessemer will educate himself, with the help of a school, or without it maybe; but the three-fourths of a given class who are to become a most important feature in the success of the works to which they go, must be aided to form a special bent for themselves.



MILLING-ROOM.

The methods pursued in all the engineering courses of the Massachusetts institute of technology for accomplishing the above object are well illustrated in the department of mining engineering and metallurgy, which has recently enlarged and refitted its laboratories. The plan is to assign the maximum amount of time possible in a four-years' course to the usual mental training for the profession, including the principles of chemistry, physics, mathematics, and modern languages, — all of them subjects best learned at school, — together with an amount of laboratory-work as small

in quantity as will successfully accomplish the following purposes: namely, first, to illustrate, amplify, and explain the use and bearing of the theoretical training; and, second, by some actual experience to eradicate the conceit and superficiality which so often follows from book-knowledge only, and in this way to give the student a suitable introduction to the world. Experience shows that this course gives a student an insight into the bearing and use of



Water jacketed furnace for copper or lead. Slag-kettle. Lead reverberatory furnace. Lead-kettle. Copper-refining reverberatory furnace.

FURNACE-ROOM.

much of his mental work, and serves as an initiation to his profession where competition is sharp, and only the most teachable and industrious can survive.

The new mining laboratories have an area of floor-space of between five and six thousand square feet. They are furnished with apparatus for the mechanical preparation of ores for furnace-work, for lixiviation, and for assaying, each of these subjects being assigned a separate room. The machines and furnaces are arranged in a manner which an experience of thirteen years has shown to be the best for the class-work of students. While in a large establishment it is desirable to have as many as possible of the machines run automatically, in a laboratory for instruction it is desirable, on the other hand, not to have the machines and furnaces run automatically, else the students will fail to gain the very experience which they need.

When the students begin their work on ores in the last year of their course, they are already practised analysts, having had a three-years' training in the chemical laboratories, and a course in assaying. They are already looking toward actual work in eight months' time, and they fully appreciate the opportunity given them to make a somewhat intimate acquaintance with the tools and processes of the professions they hope to follow.

A few examples of investigations which have been made will suffice for illustration. Two students were given gold ores to treat. The first one had an ore from New Hampshire weighing 4,440 pounds: the second had an ore from Nova Scotia weighing 1,400 pounds. The problem given them to solve in the case of each ore was as follows: 1. Is the ore a free-milling ore? 2. Is the gold in a fine, or coarse condition? 3. How many amalgamated plates are needed to catch the whole of the

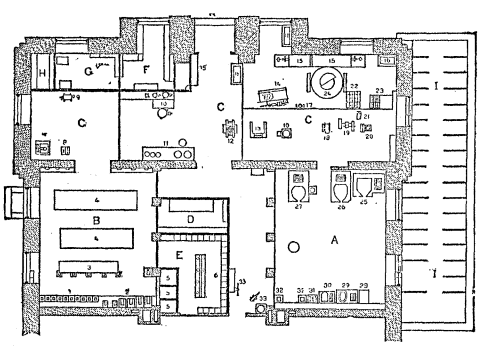
gold? 4. Will there be much waste in treating the ore? 5. If so, how much, and what means should be adopted to avoid it?

The rock was crushed fine in a stamp-mill, and the fine sand was conducted by the agency of water over a series of amalgamated copper plates, by which any active or free-milling gold was taken up, and the passive, rusty, included gold was allowed to pass on, together with the sand. This sand, before going to waste, was treated on a concentrator; and from the product or concentrate the greater part of escaped gold could have been extracted by chlorine.

The yield of gold per ton was as follows: —

	Nova-Scotia ore.	New-Hampshire ore.
	Coarse nuggets.	Very fine grains.
Gold in the amalgam of the stamp-mill	$13.040	$2.28
Gold on the first plate . . .	0.200	1.35
Gold on the second plate . .	0.010	0.11
Gold on the third plate . . .	0.030	0.09
Gold on the fourth plate . .	0.007	0.05
Gold on the fifth plate . . .	0.002	0.03
Gold in the concentrates . .	0.150	0.37
Gold on the additional mercury trap	–	0.02

From these experiments the students ascertained that the Nova-Scotia gold is very coarse, is almost all saved in the stamp-mill, and less



A, furnace-room; B, assay-room; C, milling-room; D, supply-room; E, toilet-room; F, private laboratory; G, office; H, balance-room; I, vaults; J, entrance to vaults.

than five plates will answer for treatment, and that the concentrates yield very little additional gold; while New-Hampshire gold is quite fine, is not much more than half saved in the stamp-mill, that five plates are not enough, and if the series were continued to eight or ten the last would probably more than pay for itself, and that considerable gold is saved in the concentrates.

A third student had a lot of galena weighing one ton to treat for lead, silver, and gold. Aided by his classmates, he crushed the ore, sampled, calcined, sintered, and smelted it, obtaining base bullion. He extracted the gold and silver by the zinc process, followed by cupellation. The silver-gold brick obtained was carefully valued, as were also all his products throughout the test. The losses in the process were, —

	Per cent.	*Per cent.*	*Per cent.*
In calcining	Lead, 5.	Silver, 2.	Gold, 0.
In smelting	Lead, 12.	Silver, 7.	Gold, 4.
In cupelling	Lead, 8.	Silver, 6.	Gold, 1.
Total losses	Lead, 25.	Silver, 15.	Gold, 5.

From the results, not only did he learn with his own hands and eyes where the greatest difficulties are to be encountered in lead and silver smelting, but also the familiarity with this process rendered his reading upon the smelting of copper, iron, and other metals, far more intelligible and real.

When work by day only is called for, there is enough of the spirit of investigation in nearly every student to carry him over the tedious part of his task for the sake of the results he sees immediately within reach. When the test lasts through the night also, as happens three or four times during the year, there is always enough of the savor of camping out to help keep up the interest.

SILVER FROM A PENNSYLVANIA MOUND.

SITUATED near the town of Irvine, Warren county, Penn., on a very pretty and fertile bottom of the Alleghany valley, are two mounds, well known for the last seventy years. No opening had been made in either in this time, except a shallow pit dug in the side of the smaller about fifty years ago. While spending a few days last summer in that region, I obtained permission of the very intelligent and courteous owner, Dr. William A. Irvine, to make a thorough exploration of them.

The smaller, which is on the bank of the river, near the point where it is joined by the Brokenstraw Creek, is circular, fifty-two feet in diameter, and three feet and a half high, but has evidently been considerably lowered and expanded by the plough, as the land has been under cultivation for at least sixty years,